1. PLANT MICROFOSSILS FROM THE UPPER CRETACEOUS AND LOWER TERTIARY LAYERS OF NORTHERN SPAIN II.

M. KEDVES

Cell Biological and Evolutionary Micropaleontological Laboratory of the Department of Botany of the J. A. University, H–6701, P. O. Box 993, Szeged, Hungary

Abstract

This paper presents the qualitative and quantitative palynological data isolated from the sediments of the locality of Quintanilla La Ojada – Losa Valley (Northern Spain). Three new form-species were described, these are the following: *Triangulotricolporites ibericus* n. fsp., *Plicapollis ibericus* n. fsp., *Retistephanoporites krutzschii* n. fsp. To evaluate the quantitative spore-pollen data the stratigraphical units of MARTINS (1988) were used. Regarding the preservation of the different samples very important differences were observed. The samples of the lower part of the sections (Santonian and Campanian) are very poor in sporomorphs, some *Normapolles* taxa (cf. *Complexiopollis, Praebasopollis* and *Vacuopollis*) represent the early *Brevaxonate* pollen grains. The basal layer is rich in *Dinokystes.* Remarkable occurrence of the *Hystrichosphaeridae* was observed at the middle part of the Campanian. Well preserved and rich pollen assemblages were observed in some samples of the U. Maestrichtian – Paleocene and Paleocene with several pecularities, as follows: 1. The characteristic boreal Maestrichtian *Normapolles* taxa (*Pseudotrudopollis* fspp., *Kriegeripollenites* fsp., *Hofkeripollenites* fspp., *Romeinipollenites* fsp., etc.) were not observed. 2. The richness of the form-genus *Ilexpollenites* is also unusual. 3. Several *Normapolles* and *Postnormapolles,* which are characteristic for the Paleocene layers were observed. From this point of view the form-genus *Stephanoporopollenites* must be emphasized. 4. The larger size of the *Normapolles* and *Postnormapolles* which was first published from the Paleocene sediments of Loksbergen was also observed here. Two Paleocene samples (Zone, G) are extremely rich in the cysts of *Hystrichosphaeridae,* and in several types of *angiosperm* pollen grains. One sample was investigated from the Eocene which is extremely poor in organic microremains.

Key words: Palynology, fossil, Cretaceous, Tertiary, Northern Spain.

Introduction

The history of the investigations of the Upper Cretaceous spore-pollen assemblages of Spain was shortly reviewed in a previous paper (KEDVES, 1994). The survey of the bibliographical data of the Paleocene and Eocene sediments of Spain will be the subject of the next contribution of this number (KEDVES, SOLÉ DE PORTA and MARTIN-ALGARRA, 1996).

This second part, which is at the same time the terminal paper of this program presents the LM data of the palynological data of the samples investigated from the upper part of the section Quintanilla La Ojada – Losa Valley. These slides were also sent me for palynological investigations by Dr. Ulrich P. MARTINS (Department

of Geology and Paleontology of the University Tübingen, R. F. Germany). The localisation of the sampling was illustrated in the Text-fig. 3.1., p. 30, the stratigraphical column with the sampling in Text-fig. 3.2., p. 32 in the above mentioned paper (KEDVES, 1994).

Material and Methods

The LM investigations were made on a JENAVAL (Carl Zeiss, Jena) instrument with oil immersion objective GF-Planachromat H1 100x 1,2500/0,17–A. The results will be presented in two parts:

1. The qualitative data follow the morphological taxonomy, based on the fundamental monographs of THOMSON and PFLUG (1953), PFLUG (1953b) and POTONIÉ (1956, 1958, 1960, 1966, 1970, 1975).

2. In the description of the quantitative data an attempt was made for the following points.

2.1. To present a general aspect of the composition of the palynomorphs. This is the basis for the reconstruction of the most important characteristic features of the vegetation surrounding the sedimentary basin.

2.2. The abundance of the *Dinokystes* and the *Hystrichosphaeridae* indicate marine conditions.

2.3. At every sample, the presence or the relative abundance of the stratigraphically important taxa is also enumerated.

Results

QUALITATIVE DATA
SPORITES

Perotrilites fsp., *Selaginellaceae, Selaginella* (Plate 1.1., figs. 1,2).

POLLENITES
LONGAXONES

Polycolpites transdanubicus KEDVES 1978, *Rubiaceae*, cf. *Carlemannia* (Plate 1.1., figs. 3,4),
Cupuliferoidaepollenites quisqualis (POTONIÉ 1934) POTONIÉ 1960, *Fagaceae* v. *Leguminosae* (Plate 1.1., figs. 5,6),
Retitricolpites fsp. A (Plate 1.1., figs. 7,8),
Retitricolpites fsp. B (Plate 1.1., figs. 9,10),
Psilatricolporites globus (H. DEÁK 1960) KEDVES 1978, *Sapotaceae* (Plate 1.1., figs. 11,12),
Cupuliferoipollenites pusillus (POTONIÉ 1934) POTONIÉ 1960, *Fagaceae*, cf. *Castanea* (Plate 1.1., figs. 13,14),
Intrabaculitricolporites circulus KEDVES 1978 (Plate 1.1., figs. 15,16),
Intrabaculitricolporites baculatus (KRUTZSCH 1961) n. comb. (Plate 1.1., figs. 17,18),

Basionym: *Tricolporopollenites baculatus* n. fsp.
KRUTZSCH 1961, p. 320; plate V, figs. 115–117,
Fig. 116, Plate 2, in KRUTZSCH, PCHALEK and SPIEGLER 1960.
Striatricolporites solé de portai (KEDVES 1965a) KEDVES 1978, *Fabaceae* (Plate 1.1., figs. 19,20),
Retitricolporites fsp. (Plate 1.1., figs. 21,22),
Foveotricolporites snopkovae KEDVES 1978, *Euphorbiaceae* (Plate 1.1., figs. 23,28),
Foveotricolporites gruas-cavagnettoae KEDVES 1978, cf. *Rhamnaceae* (Plate 1.1., figs. 24,25),
Foveotricolporites fsp. (Plate 1.1., figs. 26,27),
Ilexpollenites margaritatus (POTONIÉ 1931) THIERGART 1937 f. *medius* PFLUG and THOMSON 1953, *Aquifoliaceae* (Plate 1.1., figs. 29–32),
Ilexpollenites margaritatus (POTONIÉ 1931) THIERGART 1937 f. *minor, Aquifoliaceae* (Plate 1.1., figs. 33,34),
Tetracolporopollenites hungaricus KEDVES 1965a, *Sapotaceae* (Plate 1.2., figs. 1,2),
Pentapollenites pentangulus (PFLUG 1953a) KRUTZSCH 1958 subfsp. *crassicus* KRUTZSCH 1962, *Elaeagnaceae* v. *Simarubaceae* (Plate 1.2., figs. 3,4),
Pentapollenites pentangulus (PFLUG 1953a) KRUTZSCH 1958 subfsp. *foveostriatus* KRUTZSCH 1962, *Elaeagnaceae* v. *Simarubaceae* (Plate 1.2., figs. 5,6),
Pentapollenites laevigatus KRUTZSCH 1962 subfsp. *laevigatoides* KRUTZSCH 1962, *Elaeagnaceae* v. *Simarubaceae* (Plate 1.2., figs. 7,8).

BREVAXONES
NORMAPOLLES

Complexiopollis funiculus TSCHUDY 1973 (Plate 1.2., figs. 9–12),
Praebasopollis praebasalis GROOT and KRUTZSCH 1967 (Plate 1.2., figs. 13,14),
Psittacopollis elaeagnoides (ZAKLINSKAYA 1963) KEDVES 1967 (Plate 1.2., figs. 15,16),
Basopollis urkutensis KEDVES 1974 (Plate 1.2., figs. 17,18),
Basopollis basalis (PFLUG 1953a) PFLUG 1953b (Plate 1.2., figs. 19,20),

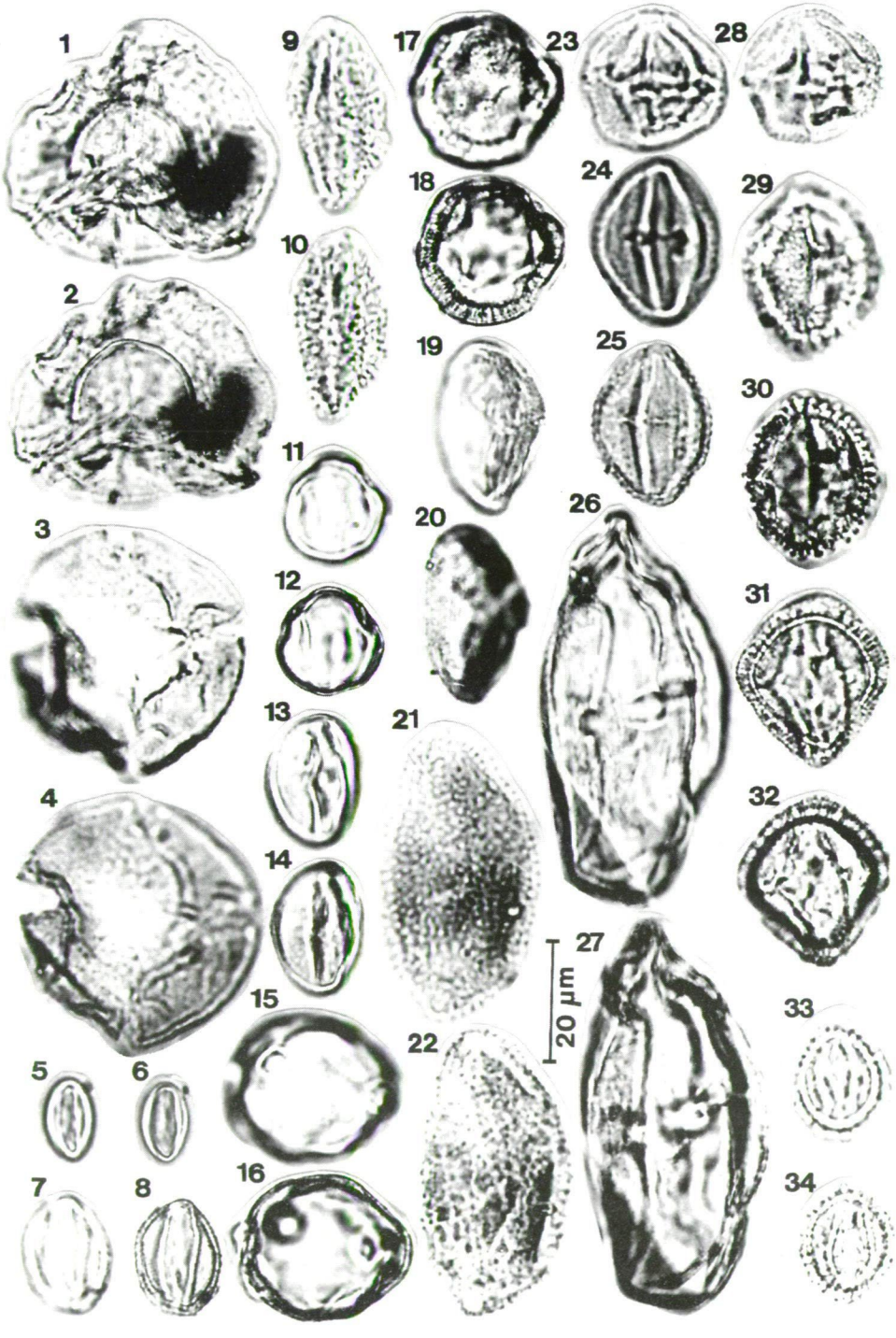
Triangulotricolporites ibericus n. fsp.
(Plate 1.2., figs. 21–26)

Diagnosis

Tricolporate pollen grains. In polar view, amb triangular, with convex sides. Surface scabrate-punctate. The exine in the inter-apertural region is 2.8–3.2 μm thick the infratectal layer is thin, intragranular. Exoapertures colpi, about 8.0–12.0 μm long, and 2.0–4.0 μm wide at the tectum. The nexine thickens in the apertural area (4.5–6.0 μm). The endanulus is about 3.5–4.0 μm thick. Endoapertures 8.0–14.0 μm long. At the poles there are triangular thickenings or thinnings. The arms of the tetrad scar-like ornamentation are oriented in the middle of the inter-apertural area.

Diameter: 20–28 μm.

Holotype: Plate 1.2., figs. 25,26, slide: 89/13–1; cross-table number: 23.6/118.9.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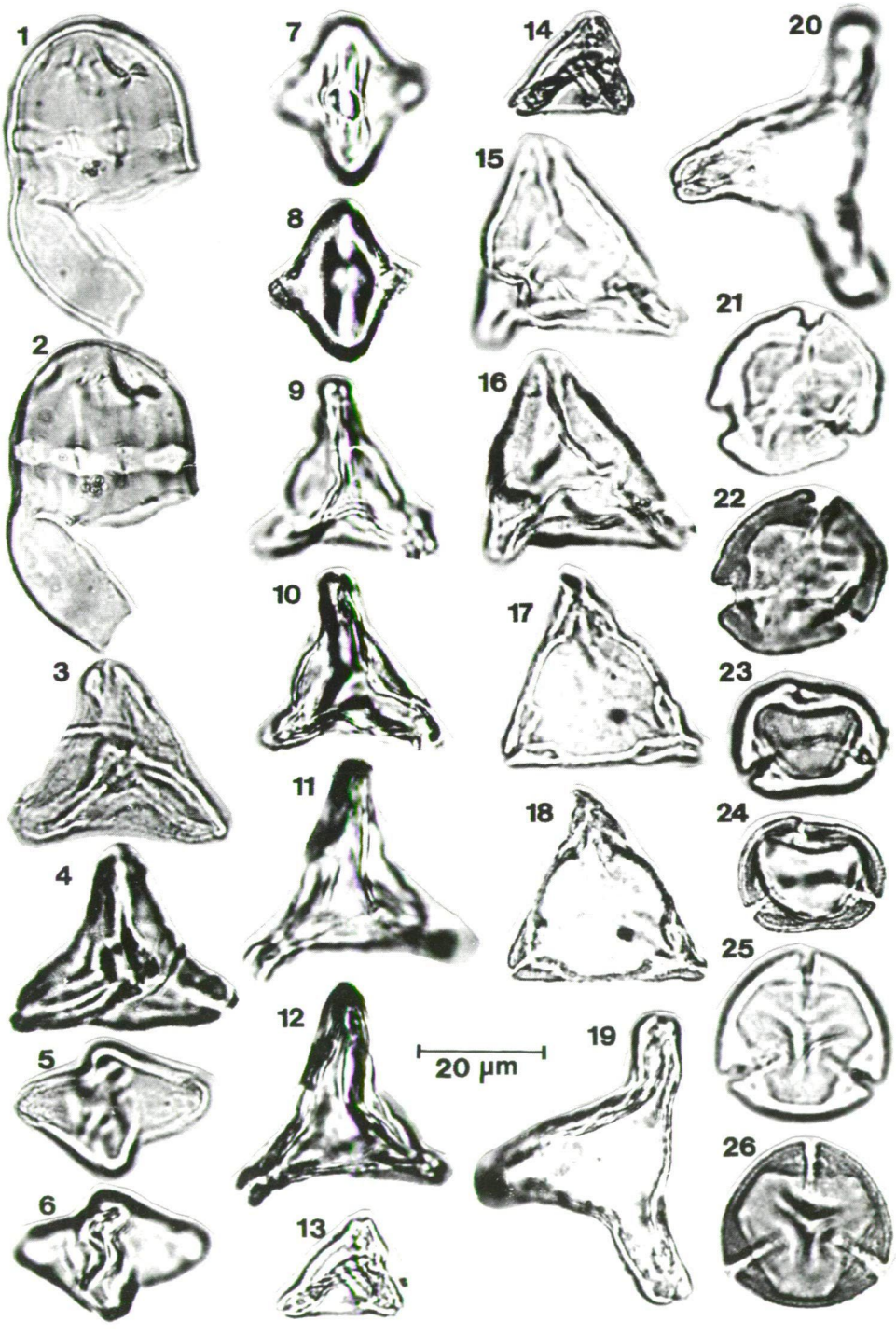
Locus typicus: Quintanilla La Ojada.
Stratum typicum: Sandy marl with limestone.
Derivatio nominis: From Iberia.
Differential diagnosis: The ornamentation of the surface and the peculiar polar ornamentation differs well from *T. triangulus* KAR 1985.
Nudopollis endangulatus (PFLUG 1953a) PFLUG 1953b (Plate 1.3., figs. 1–10),
Nudopollis minutus ZAKLINSKAYA 1963 (Plate 1.3., figs. 11,12),
Papillopollis aregulus PFLUG 1953b (Plate 1.3., figs. 13,14),
Stephanoporopollenites hexaradiatus (THIERGART 1940) THOMSON and PFLUG 1953 subfsp. *hexaradiatus* (Plate 1.3., figs. 17–20),
Stephanoporopollenites hexaradiatus (THIERGART 1940) THOMSON and PFLUG 1953 subfsp. *tribinae* KRUTZSCH 1961 (Plate 1.3., figs. 21,22),
Stephanoporopollenites hexaradiatus (THIERGART 1940) THOMSON and PFLUG 1953 subfsp. *semitribinae* KRUTZSCH 1961 (Plate 1.3., figs. 23,24),
Stephanoporopollenites pentaradiatus KRUTZSCH 1961 (Plate 1.3., figs. 25,26),
Stephanoporopollenites praehexaradiatus KRUTZSCH and LENK 1967 (Plate 1.3., figs. 27,28),
Interpollis supplingensis (PFLUG 1953a) KRUTZSCH 1961 (Plate 1.4., figs. 1–4),

Plate 1.1.

1,2. *Perotrilites* fsp., *Selaginellaceae, Selaginella,* slide: 89/1-2; cross-table number: 10.3/135.0.
3,4. *Polycolpites transdanubicus* KEDVES 1978, *Rubiaceae,* cf. *Carlemannia,* slide: 99/1-2; cross-table number: 6.6/123.1.
5,6. *Cupuliferoidaepollenites quisqualis* (POTONIÉ 1934) POTONIÉ 1960, *Fagaceae* v. *Leguminosae,* slide: 89/8-2; cross-table number: 11.9/117.1.
7,8. *Retitricolpites* fsp. A, slide: 89/1-1; cross-table number: 12.4/120.5.
9,10. *Retitricolpites* fsp. B, slide: 89/13-3; cross-table number: 21.2/129.1.
11,12. *Psilatricolporites globus* (H.DEÁK 1960) KEDVES 1978, *Sapotaceae*, slide: 99/1-2; cross-table number: 6.6/123.1.
13,14. *Cupuliferoipollenites pusillus* (POTONIÉ 1934) POTONIÉ 1960, *Fagaceae,* cf. *Castanea,* slide: 89/1-2; cross-table number: 17.1/122.6.
15,16. *Intrabaculitricolporites circulus* KEDVES 1978, slide: 89/2A-1; cross-table number: 11.4/125.2.
17,18. *Intrabaculitricolporites baculatus* (KRUTZSCH 1961) n. comb., slide: 89/2A-3; cross-table number: 14.9/136.9.
19,20. *Striatricolporites solé de portai* (KEDVES 1965a) KEDVES 1978, *Fabaceae,* slide: 99/1-2; cross-table number: 17.8/120.8.
21,22. *Retitricolporites* fsp., slide: 89/9-3;cross-table number: 11.6/135.2.
23,28. *Foveotricolporites snopkovae* KEDVES 1978, *Euphorbiaceae,* slide: 89/13-3; cross-table number: 21.8/122.8.
24,25. *Foveotricolporites gruas-cavagnettoae* KEDVES 1978, cf. *Rhamnaceae,* slide: 89/13-3; cross-table number: 17.9/126.2.
26,27. *Foveotricolporites* fsp., slide: 89/1-1; cross-table number: 16.3/132.3.
29,30. *Ilexpollenites margaritatus* (POTONIÉ 1931) THIERGART 1937 f. *medius* PFLUG and THOMSON 1953, *Aquifoliaceae, Ilex,* slide: 89/2A-3; cross-table number: 13.1/125.4.
31,32. *Ilexpollenites margaritatus* (POTONIÉ 1931) THIERGART 1937 f. *medius* PFLUG and THOMSON 1953, *Aquifoliaceae, Ilex,* slide: 89/2A-2; cross-table number: 11.9/139.6.
33,34. *Ilexpollenites margaritatus* (POTONIÉ 1931) THIERGART 1937 f. *minor, Aquifoliaceae,* slide: 89/13-3; cross-table number: 16.6/127.9.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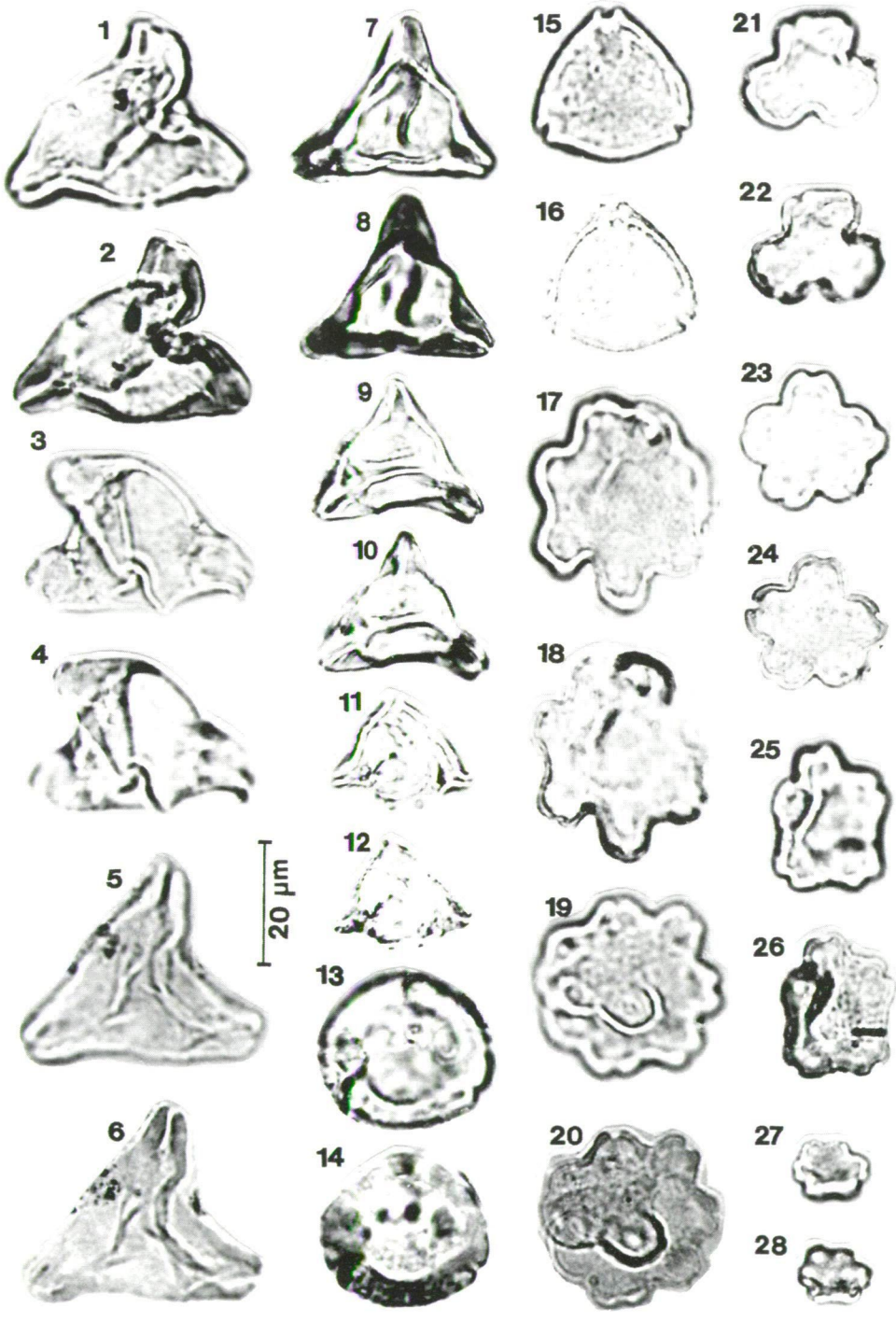
Interpollis messelensis KRUTZSCH 1961 (Plate 1.4., figs. 5,6),
Interpollis microsupplingensis KRUTZSCH 1961 (Plate 1.4., figs. 7,8),
Interpollis velum KRUTZSCH 1961 (Plate 1.4., figs. 9–16),
Vacuopollis concavus (PFLUG 1953a) KRUTZSCH 1960 in KRUTZSCH, PCHALEK and SPIEGLER (Plate 1.4., figs. 17,18),
Megatriopollis cf. *santonius* GROOT and KRUTZSCH 1967 (Plate 1.4., figs. 19,20),
Pecakipollis bohemiensis KRUTZSCH and PACLTOVÁ 1967 (Plate 1.4., figs. 23,24),
Jarzenipollenites trinus (STANLEY 1965) KEDVES 1979 (Plate 1.4., figs. 25,26),
Gallopollis fsp. (Plate 1.4., figs. 27,28),
Plicapollis pseudoexcelsus (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *semiturgidus* PFLUG 1953a, cf. *Myricaceae* (Plate 1.4., figs. 29–34),
Plicapollis pseudoexcelsus (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *turgidus* PFLUG 1953a, cf. *Myricaceae* (Plate 1.4., figs. 35–38),
Plicapollis pseudoexcelsus (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *luteticus* KEDVES 1969 cf. *Myricaceae* (Plate 1.4., figs. 39,40),
Plicapollis pseudoexcelsus (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *minor* PFLUG 1953a (Plate 1.4., figs. 41,42).

Plate 1.2.

1,2. *Tetracolporopollenites hungaricus* KEDVES 1965a, *Sapotaceae,* slide: 99/1-1; cross-table number: 18.2/148.8.
3,4. *Pentapollenites pentangulus* (PFLUG 1953a) KRUTZSCH 1958 subfsp. *crassicus* KRUTZSCH 1962, *Elaeagnaceae* v. *Simarubaceae,* slide: 89/13-2; cross-table number: 13.8/120.6.
5,6. *Pentapollenites pentangulus* (PFLUG 1953a) KRUTZSCH 1958 subfsp. *foveostriatus* KRUTZSCH 1962, *Elaeagnaceae* v. *Simarubaceae,* slide: 89/13-1; cross-table number: 11.3/128.9.
7,8. *Pentapollenites laevigatus* KRUTZSCH 1962 subfsp. *laevigatoides* KRUTZSCH 1962, *Elaeagnaceae* v. *Simarubaceae,* slide: 89/2A-3; cross-table number:14.2/127.1.
9,10. *Complexiopollis funiculus* TSCHUDY 1973, slide: 89/2A-1; cross-table number: 8.8/128.2.
11,12. *Complexiopollis funiculus* TSCHUDY 1973, slide: 89/2A-1; cross-table number: 16.8/129.2.
13,14. *Praebasopollis praebasalis* GROOT and KRUTZSCH 1967, slide: 154/1-2; cross-table number: 11.3/130.3.
15,16. *Psittacopollis elaeagnoides* (ZAKLINSKAYA 1963) KEDVES 1967, slide: 89/1-2; cross-table number: 17.5/136.8.
17,18. *Basopollis urkutensis* KEDVES 1974, slide: 99/1-1; cross-table number: 15.1/137.6.
19,20. *Basopollis basalis* (PFLUG 1953a) PFLUG 1953b, slide: 89/1-2; cross-table number: 9.3/133.1.
21,22. *Triangulotricolporites ibericus* n. fsp., slide: 89/13-3; cross-table number: 21.5/127.8.
23,24. *Triangulotricolporites ibericus* n. fsp., slide: 89/13-1; cross-table number: 11.9/124.7.
25,26. *Triangulotricolporites ibericus* n. fsp., slide: 89/13-1; cross-table number: 23.6/118.9.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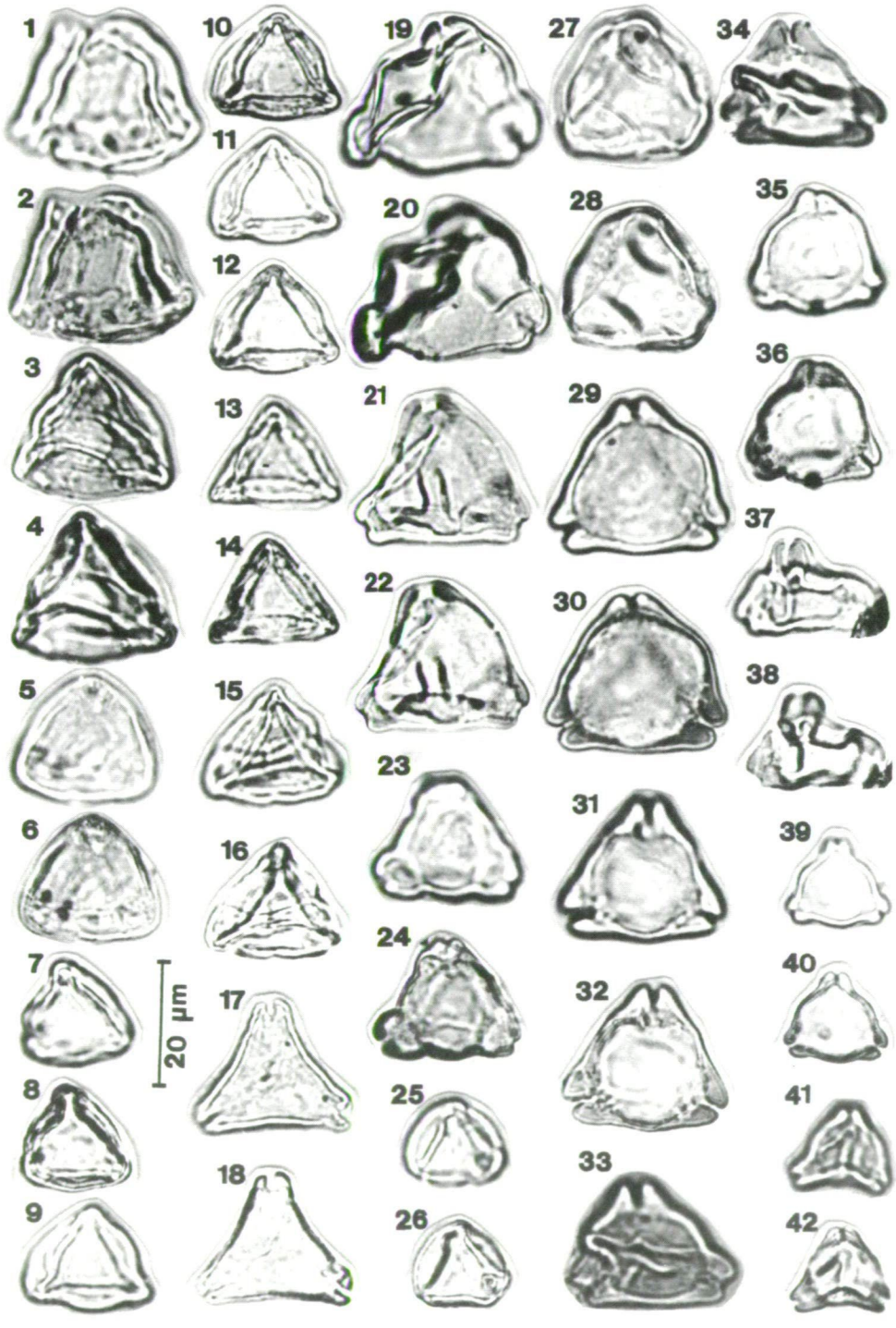
Plicapollis ibericus n. fsp.
(Plate 1.5., figs. 1–6)

Diagnosis

Triatriate, plicate pollen grains. Amb triangular, with convex sides. Inter-aperturral exine 1.5–2.0 μm thick, the infratectal layer is the thinnest between the ectexine layers. Structure intragranulate. Anulus 5.0–7.0 μm thick. Exoapertures short colpi (4.0–5.0 x 2.0–3.0 μm), endoapertures atria, intragranulate and 8.0 μm wide. Characteristic plicae are on the proximal side.
Diameter: 40.0–50.0 μm.
Holotype: Plate 1.5., figs. 5,6, slide: 89/13–2; cross-table number: 23.5/132.2.
Locus typicus: Quintanilla La Ojada.
Stratum typicum: Sandy marl with limestone.
Derivatio nominis: From Iberia.
Differential diagnosis: The relatively large size within the form-genus distincts well from the other form-species, particularly from *P. pseudoexcelsus semiturgidus*.
Caratinipollenites paleocenicus KEDVES and RUSSELL 1982 (Plate 1.5., figs .7,8).

Plate 1.3.

1,2. *Nudopollis endangulatus* (PFLUG 1953a) PFLUG 1953b, slide: 89/13-2; cross-table number: 7.7/124.2.
3,4. *Nudopollis endangulatus* (PFLUG 1953a) PFLUG 1953b, slide: 89/13-3; cross-table number: 21.8/123.2.
5,6. *Nudopollis endangulatus* (PFLUG 1953a) PFLUG 1953b, slide: 89/13-3; cross-table number: 22.0/118.5.
7,8. *Nudopollis endangulatus* (PFLUG 1953a) PFLUG 1953b, slide: 89/13-2; cross-table number: 20.6/130.1.
9,10. *Nudopollis endangulatus* (PFLUG 1953a) PFLUG 1953b, slide: 89/13-2; cross-table number: 11.5/134.1.
11,12. *Nudopollis minutus* ZAKLINSKAYA 1963, slide: 89/9-1; cross-table number: 12.4/125.8.
13,14. *Papillopollis aregulus* PFLUG 1953b, slide: 89/21-1; cross-table number:11.6/127.3.
15,16. *Triporopollenites robustus* PFLUG 1953a subfsp. *robustus*, slide: 89/13-1; cross-table number:13.1/121.9.
17,18. *Stephanoporopollenites hexaradiatus* (THIERGART 1940) THOMSON and PFLUG 1953 subfsp. *hexaradiatus*, slide: 89/13-1; cross-table number:16.9/125.8.
19,20. *Stephanoporopollenites hexaradiatus* (THIERGART 1940) THOMSON and PFLUG 1953 subfsp. *hexaradiatus*, slide: 89/13-2; cross-table number: 23.8/132.1.
21,22. *Stephanoporopollenites hexaradiatus* (THIERGART 1940) THOMSON and PFLUG 1953 subfsp. *tribinae* KRUTZSCH 1961, slide: 89/1-3; cross-table number: 7.9/128.9.
23,24. *Stephanoporopollenites hexaradiatus* (THIERGART 1940) THOMSON and PFLUG 1953 subfsp. *semitribinae* KRUTZSCH 1961, slide: 89/13-1; cross-table number: 6.1/129.1.
25,26. *Stephanoporopollenites pentaradiatus* KRUTZSCH 1961, slide: 89/13-1; cross-table number: 18.8/121.3.
27,28. *Stephanoporopollenites praehexaradiatus* KRUTZSCH and LENK 1967, slide: 89/13–1; cross-table number: 12.0/121.9.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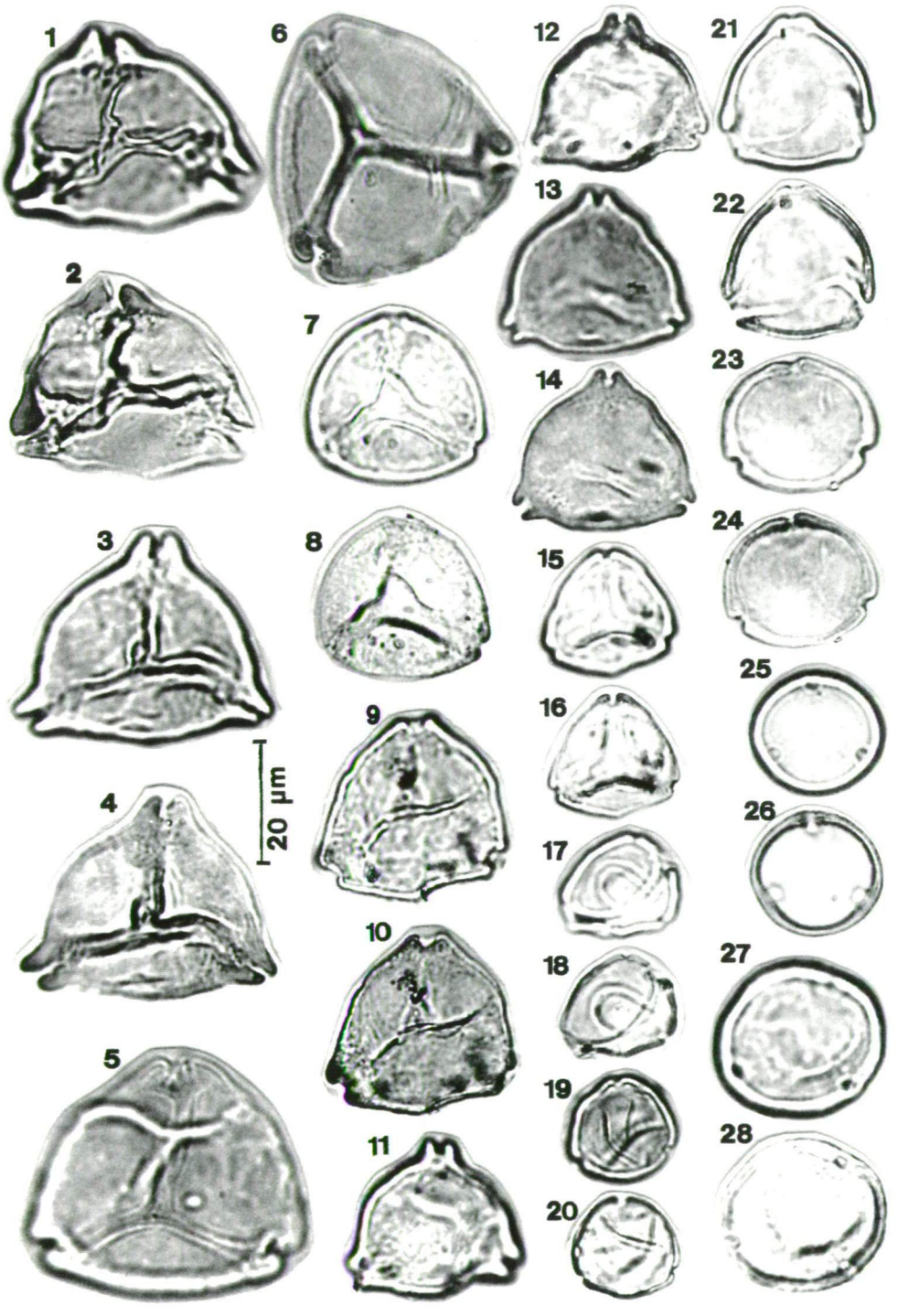
Alabroidaepollenites aroboratus (PFLUG 1953a) KEDVES and RUSSELL 1982 (Plate 1.5., figs. 9,10),
Triatriopollenites roboratus PFLUG 1953a (Plate 1.4., figs. 21,22),
Triatriopollenites takahashii KEDVES and HERNGREEN 1980 (Plate 1.5., figs. 11–14),
Plicatopollis plicatus (POTONIÉ 1934) KRUTZSCH 1962, *Juglandaceae* (Plate 1.5., figs. 15,16),
Platycaryapollenites swasticoidus (ELSIK 1974) FREDERIKSEN and CHRISTOPHER 1978, *Juglandaceae, Platycarya* (Plate 1.5., figs. 17,18),
Platycaryapollenites platycaryoides (ROCHE 1969) FREDERIKSEN and CHRISTOPHER 1978, *Juglandaceae, Platycarya* (Plate 1.5., figs. 19,20),
Triporopollenites robustus PFLUG 1953a subfsp. *robustus* (Plate 1.3., figs. 15,16),
Triporopollenites cf. *vancampoae* KEDVES 1970 (Plate 1.5., figs. 21,22),
Triporopollenites pflugii KEDVES 1974, *Juglandaceae* (Plate 1.5., figs. 23,24),

Plate 1.4.

1,2. *Interpollis supplingensis* (PFLUG 1953a) KRUTZSCH 1961, slide: 89/13-1; cross-table number: 22.6/120.4.
3,4. *Interpollis supplingensis* (PFLUG 1953a) KRUTZSCH 1961, slide: 89/13-2; cross-table number: 21.7/136.5.
5,6. *Interpollis messelensis* KRUTZSCH 1961, slide: 89/1-3; cross-table number: 5.9/133.0.
7,8. *Interpollis microsupplingensis* KRUTZSCH 1961, slide: 89/2A-2; cross-table number: 6.8/133.9.
9,10. *Interpollis velum* KRUTZSCH 1961, slide: 89/1-3; cross-table number: 12.1/132.3.
11,12. *Interpollis velum* KRUTZSCH 1961, slide: 89/1-3; cross-table number: 11.9/132.3.
13,14. *Interpollis velum* KRUTZSCH 1961, slide: 89/1-3; cross-table number: 7.5/134.7.
15,16. *Interpollis velum* KRUTZSCH 1961, slide: 89/13-1; cross-table number: 18.8/126.5.
17,18. *Vacuopollis concavus* (PFLUG 1953a) KRUTZSCH 1960 in KRUTZSCH, PCHALEK and SPIEGLER , slide: 154/1-1; cross-table number: 19.6/125.6.
19,20. *Megatriopollis* cf. *santonius* GROOT and KRUTZSCH 1967, slide: 89/1-3; cross-table number 15.2/130.6.
21,22. *Triatriopollenites roboratus* PFLUG 1953a, slide: 89/9-3; cross-table number: 24.5/137.8.
23,24. *Pecakipollis bohemiensis* KRUTZSCH and PACLTOVÁ 1967, slide: 89/2A-2; cross-table number: 6.8/133.9.
25,26. *Jarzenipollenites trinus* (STANLEY 1965) KEDVES 1979, slide: 89/1-1; cross-table number: 11.8/124.2.
27,28. *Gallopollis* fsp., slide: 89/1-3; cross-table number: 6.8/119.8.
29,30. *Plicapollis pseudoexcelsus* (KRUTZSCH 1958) KRUTZSCH 1961 subsp. *semiturgidus* PFLUG 1953a, cf. *Myricaceae*, slide: 89/1-2; cross-table number: 21.7/129.1.
31,32. *Plicapollis pseudoexcelsus* (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *semiturgidus* PFLUG 1953a, cf. *Myricaceae*, slide: 89/1-3; cross-table number: 11.8/137.9.
33,34. *Plicapollis pseudoexcelsus* (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *semiturgidus* PFLUG 1953a, cf. *Myricaceae,* slide: 89/13-3; cross-table number: 19.3/122.2.
35,36. *Plicapollis pseudoexcelsus* (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *turgidus* PFLUG 1953a, cf. *Myricaceae,* slide: 89/1-1; cross-table number: 23.4/132.6.
37,38. *Plicapollis pseudoexcelsus* (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *turgidus* PFLUG 1953a, cf.Myricaceae, slide: 89/13-3; cross-table number: 11.9/123.2.
39,40. *Plicapollis pseudoexcelsus* (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *luteticus* KEDVES 1969, cf. *Myricaceae,* slide: 89/1-3; cross-table number: 16.4/131.6.
41,42. *Plicapollis pseudoexcelsus* (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *minor* PFLUG 1953a, slide: 89/13-3; cross-table number: 20.2/135.3.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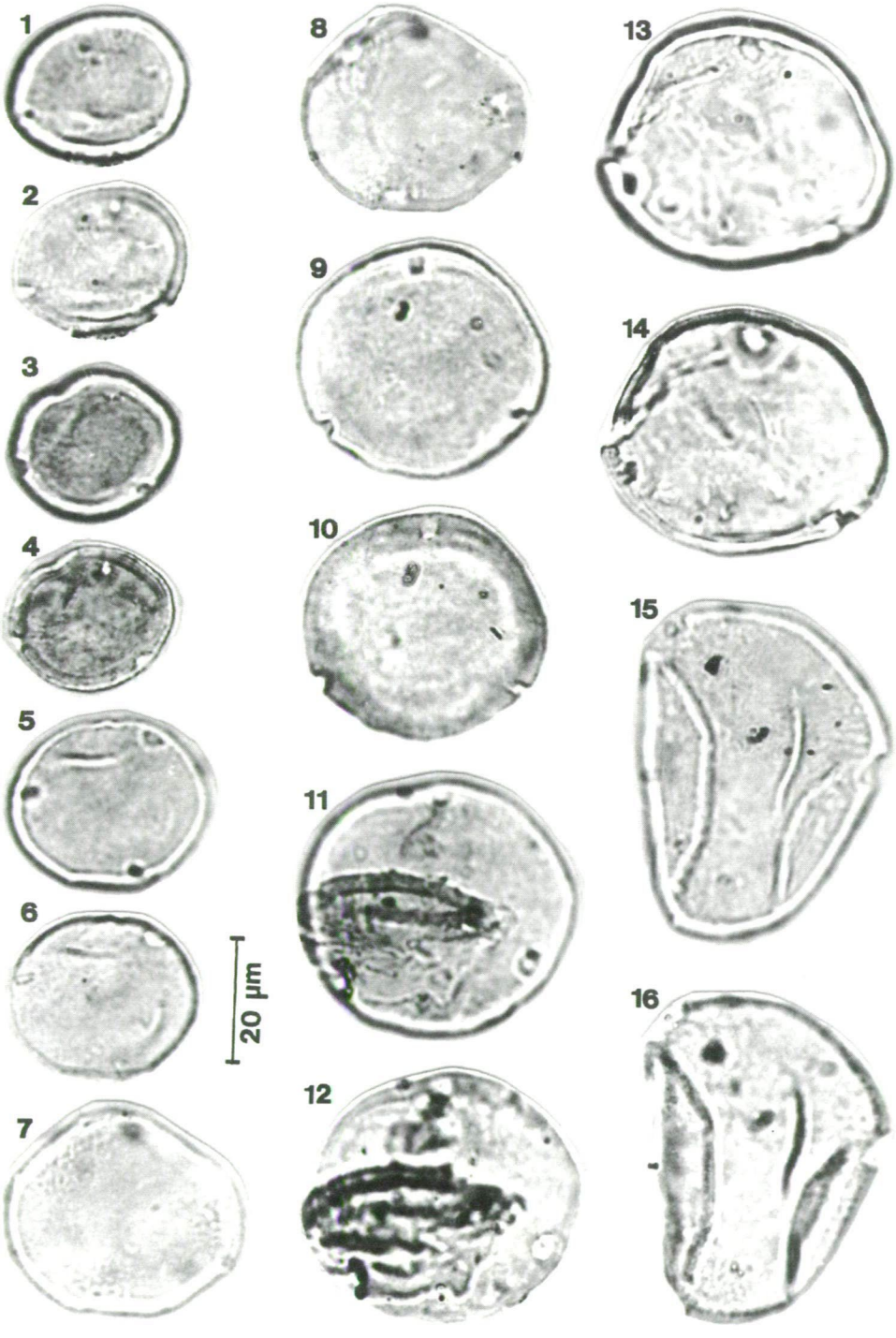
Subtriporopollenites anulatus PFLUG and THOMSON 1953 subfsp. *anulatus, Juglandaceae, Carya* (Plate 1.5., figs. 25,26),
Subtriporopollenites anulatus PFLUG and THOMSON 1953 subfsp. *nanus* PFLUG and THOMSON 1953, *Juglandaceae, Carya* (Plate 1.5., figs. 27,28),
Subtriporopollenites constans PFLUG 1953a subfsp. *constans, Juglandaceae* (Plate 1.6., figs. 1–4),
Subtriporopollenites constans PFLUG 1953a subfsp. *magnus* KRUTZSCH 1961 (Plate 1.6., figs. 5,6),
Subtriporopollenites subporatus KRUTZSCH 1961 subfsp. *subporatus* (Plate 1.6., figs. 7,8),
Subtriporopollenites subporatus KRUTZSCH 1961 subfsp. *gracillimus* KRUTZSCH and VANHOORNE 1977 (Plate 1.6., figs. 9–12),
Subtriporopollenites magnoporatus (THOMSON and PFLUG 1953) KRUTZSCH 1961 subfsp. *baculatus* KRUTZSCH and VANHOORNE 1977 (Plate 1.6., figs. 13–16, plate 1.7., figs. 1–4),
Compositoipollenites rizophorus (POTONIÉ 1934) POTONIÉ 1960 subfsp. *burghasungensis* MÜRRIGER and PFLUG 1953, *Icacinaceae* (Plate 1.7., figs. 5,6),
Intratriporopollenites fsp., *Tiliaceae* (Plate 1.7., figs. 7,8),
Symplocospollenites rotundus (POTONIÉ 1931) POTONIÉ, THOMSON and THIERGART 1950, *Symplocaceae* (Plate 1.7., figs. 9,10),

Plate 1.5.

1,2. *Plicapollis ibericus* n. fsp., slide: 89/13-1; cross-table number: 13.5/119.4.
3,4. *Plicapollis ibericus* n. fsp., slide: 89/13-3; cross-table number: 24.3/129.4.
5,6. *Plicapollis ibericus* n. fsp., slide: 89/13–2; cross-table number: 23.5/132.2.
7,8. *Caratinipollenites paleocenicus* KEDVES and RUSSELL 1982, slide: 89/1-2; cross-table number: 25.3/123.2.
9,10. *Alabroidaepollenites aroboratus* (PFLUG 1953a) KEDVES and RUSSELL 1982, slide: 89/2A-3; cross-table number: 10.2/134.6.
11,12. *Triatriopollenites takahashii* KEDVES and HERNGREEN 1980, slide: 89/1-3; cross-table number: 22.9/136.5.
13,14. *Triatriopollenites takahashii* KEDVES and HERNGREEN 1980, slide: 89/13-1; cross-table number: 23.8/121.8.
15,16. *Plicatopollis plicatus* (POTONIÉ 1934) KRUTZSCH 1962, *Juglandaceae*, slide: 89/1-3; cross-table number: 16.2/134.5.
17,18. *Platycaryapollenites swasticoidus* (ELSIK 1974) FREDERIKSEN and CHRISTOPHER 1978, *Juglandaceae, Platycarya,* slide: 89/1–1; cross-table number: 6.1/132.3.
19,20. *Platycaryapollenites platycaryoides* (ROCHE 1969) FREDERIKSEN and CHRISTOPHER 1978, *Juglandaceae, Platycarya,* slide: 89/2A–3; cross-table number: 9.8/124.3.
21,22. *Triporopollenites* cf. *vancampoae* KEDVES 1970, slide: 154/1–1; cross-table number: 19.6/125.6.
23,24. *Triporopollenites pflugii* KEDVES 1974, *Juglandaceae,* slide: 99/1–3; cross-table number: 18.3/132.1.
25,26. *Subtriporopollenites anulatus* PFLUG and THOMSON 1953 subfsp. *anulatus, Juglandaceae, Carya,* slide: 89/1–1; cross-table number: 11.2/132.1.
27,28. *Subtriporopollenites anulatus* PFLUG and THOMSON 1953 subfsp. *nanus* PFLUG and THOMSON 1953, *Juglandaceae, Carya,* slide: 89/13–2; cross-table number: 8.1/132.6.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Retistephanoporites krutzschii n. fsp.
(Plate 1.7., figs. 11–16, 21,22)

Diagnosis

In polar view amb pentangular with straight, convex or occasionally concave sides. Surface finely reticulate, the mesh of the reticulate ornamentation is about 0.5–0.9 μm. The exine is 1.6–2.0 μm thick in the inter-apertural area. The thickness of the ectexine layers is identical. Infratectal layer finely columellar. The disposition of the apertures is equatorial. The diameter of the protruding exopores is 2.5–3.5 μm, the endoapertures are larger; 3.0–5.5 μm. There are endanuli around the endopores of about 2 μm thickness.

Diameter: 34.0–48.0 μm.

Holotype: Plate 1.7., figs. 13,14, slide: 89/1–3; cross-table number: 21.2/137.1.

Locus typicus: Quintanilla La Ojada.

Derivatio nominis: In honour of Prof. Dr. W. KRUTZSCH excellent investigator of the fossil sporomorphs.

Differential diagnosis: The form-genus was originally described by GONZÁLEZ GUZMÁN (1967) as monotypic, from Lower Eocene of Columbia. The described new form-species differ from *R. angelicus* GONZÁLEZ GUZMÁN 1967 by its larger size, by the number of apertures, by the pentangular amb, and the finer reticulate ornamentation.

Reevesiapollis eocaenicus KRUTZSCH 1970, *Sterculiaceae* (Plate 1.7., figs. 17–20),

Parsonidites fsp., *?Apocynaceae* (Plate 1.8., figs. 1,2),

Striaperipollis gracillistriatus KRUTZSCH 1966, *Polemoniaceae* (Plate 1.8., figs. 3–6),

Restioniidites hungaricus (KEDVES 1965b) ELSIK 1968, *Restionaceae* (Plate 1.8., figs. 7–14),

Milfordia incerta (THOMSON and PFLUG 1953) KRUTZSCH 1961, *Restionaceae* (Plate 1.8., figs. 15,16),

Plate 1.6.

1,2. *Subtriporopollenites constans* PFLUG 1953a subfsp. *constans, Juglandaceae,* slide: 89/13–3; cross-table number: 7.3/131.9.

3,4. *Subtriporopollenites constans* PFLUG 1953a subfsp. *constans, Juglandaceae,* slide: 89/13–2; cross-table number: 14.8/134.2.

5,6. *Subtriporopollenites constans* PFLUG 1953a subfsp. *magnus* KRUTZSCH 1961, slide: 89/13–2; cross-table number: 7.2/127.8.

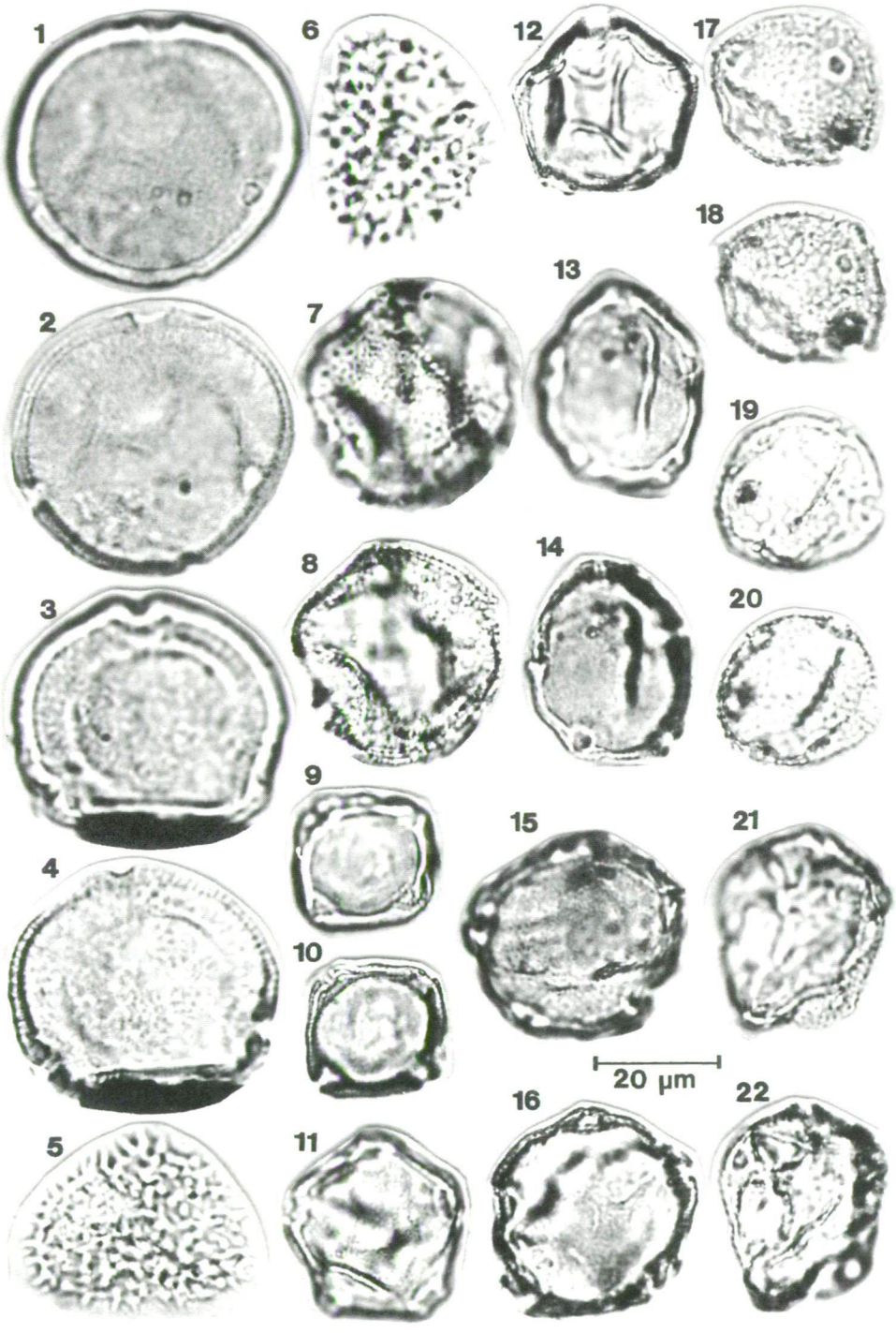
7,8. *Subtriporopollenites subporatus* KRUTZSCH 1961 subfsp. *subporatus,* slide: 89/13–3; cross-table number: 7.5/131.3.

9,10. *Subtriporopollenites subporatus* KRUTZSCH 1961 subfsp. *gracillimus* KRUTZSCH and VANHOORNE 1977, slide: 89/13–1; cross-table number: 16.2/131.7.

11,12. *Subtriporopollenites subporatus* KRUTZSCH 1961 subfsp. *gracillimus* KRUTZSCH and VANHOORNE 1977, slide: 89/13–2; cross-table number: 7.3/131.9.

13,14. *Subtriporopollenites magnoporatus* (THOMSON and PFLUG 1953) KRUTZSCH 1961 subfsp. *baculatus* KRUTZSCH and VANHOORNE 1977, slide: 89/13–1; cross-table number: 9.3/124.3.

15,16. *Subtriporopollenites magnoporatus* (THOMSON and PFLUG 1953) KRUTZSCH 1961 subfsp. *baculatus* KRUTZSCH and VANHOORNE 1977, slide: 89/13–3; cross-table number: 22.7/129.3.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Ericipites longisulcatus WODEHOUSE 1933, *Ericaceae* (Plate 1.8., figs. 17,18), *Ericipites crassiexinus* HARRIS 1972, *Ericaceae* (Plate 1.8., figs. 19,20).

QUANTITATIVE DATA

As general statement the following can be pointed out:

1. The entire absence of the *gymnosperm* pollen grains.
2. The extremely sporadic occurrence of the spores with a relatively rare type of *Selaginellaceae* in the Upper Cretaceous and Paleogene sediments.

Regarding the stratigraphical range of the samples investigated, the system of MARTINS (1988) was followed. The faunistical data of the different zone also come from the work of MARTINS (1988).

UPPER SANTONIAN – LOWER CAMPANIAN

Zone B, with *Neocrioceras riosi.*

Sample, No 154/1. – Rich in *Dinoflagellatae* cysts, poor in sporomorphs (*Praebasopollis praebasalis*, cf. *Complexiopollis* fsp., *Vacuopollis concavus, Triporopollenites* cf. *vancampoae*). At this sample the detailed taxonomical elaboration of the *Dinoflagellatae* cysts can contribute to the biostratigraphy of this zone.

Sample, No 154/5. – Extremely poor in organic remnants. Some debris of planctonic organisms were observed only.

Sample, No 144/12. – Similarly to the previous one poor in organic remnants. *Hystrichosphaeridae* cysts occur sporadically.

Plate 1.7.

1,2. *Subtriporopollenites magnoporatus* (THOMSON and PFLUG 1953) KRUTZSCH 1961 subfsp. *baculatus* KRUTZSCH and VANHOORNE 1977, slide: 89/13–1; cross-table number: 24.6/129.3.

3,4. *Subtriporopollenites magnoporatus* (THOMSON and PFLUG 1953) KRUTZSCH 1961 subfsp. *baculatus* KRUTZSCH and VANHOORNE 1977, slide: 89/13–2; cross-table number: 10.3/138.9.

5,6. *Compositoipollenites rizophorus* (POTONIÉ 1934) POTONIÉ 1960 subfsp. *burghasungensis* MÜRRIGER and PFLUG 1953, *Icacinaceae,* slide: 89/13–3; cross-table number: 13.3/130.1.

7,8. *Intratriporopollenites* fsp., *Tiliaceae,* slide: 89/2A–3; cross-table number: 22.2/129.9.

9,10. *Symplocospollenites rotundus* (POTONIÉ 1931) POTONIÉ, THOMSON and THIERGART 1950, *Symplocaceae,* slide: 89/2A–2; cross-table number: 12.4/123.6.

11,12. *Retistephanoporites krutzschii* n. fsp., slide: 89/2A–3; cross-table number: 10.5/123.3.

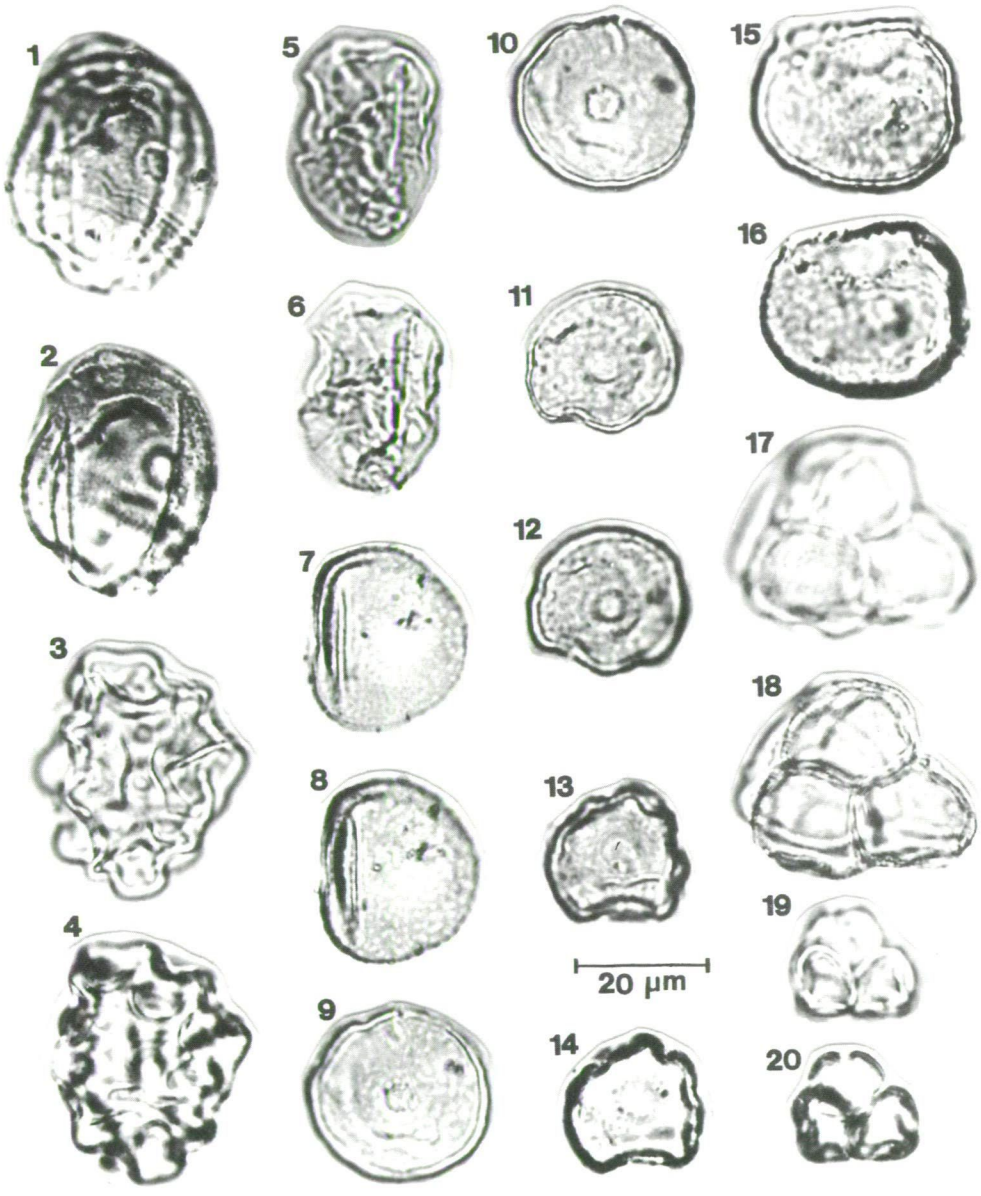
13,14. *Retistephanoporites krutzschii* n. fsp., slide: 89/1–3; cross-table number: 21.2/137.1.

15,16. *Retistephanoporites krutzschii* n. fsp., slide: 89/2A–3; cross-table number: 17.7/119.7.

17,18. *Reevesiapollis eocaenicus* KRUTZSCH 1970, *Sterculiaceae,* slide: 89/1–1; cross-table number: 7.1/125.3.

19,20. *Reevesiapollis eocaenicus* KRUTZSCH 1970, *Sterculiaceae,* slide: 89/1–1; cross-table number: 7.1/125.3.

21,22. *Retistephanoporites krutzschii* n. fsp., slide: 89/1–3; cross-table number: 11.9/121.6.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LOWER CAMPANIAN

Zone C.
Sample, No 144/1. – During our investigations organic microfossils were not observed.

MIDDLE – UPPER CAMPANIAN

Zone D.
Sample, No 144/4. – Some *Acritarch* cysts and an *Ericaceae* pollen tetrad was observed.

UPPER CAMPANIAN – LOWER MAESTRICHTIAN

Zone E.
Sample, No 89/10. – *Hystrichosphaeridae* cysts are common, without sporomorphs.
Sample, No 89/9. – *Hystrichosphaeridae* cysts are dominant, with some *angiosperm* pollen grains (*Retitricolporites* fsp., *Nudopollis minutus, Triatriopollenites roboratus*).
Sample, No 89/12. – Organic micro-remnants were not observed.

UPPER MAESTRICHTIAN – PALEOCENE

Zone F, with *Orbitoidae; Omphalocyclus macroporus, Siderolites calcitrapoides.*
Sample, No 144/6. – Some *Hystrichosphaeridae* remnant was observed only.
Sample, No 89/13. – Pollen grains of *Aquifoliaceae (Ilex)* are dominant. In view of quantity the *Myricaceae, Icacinaceae,* the caryoid types, and the pollen grains of the form-genera *Nudopollis* and *Plicapollis* are worth of mentioning. From the point of

Plate 1.8.

1,2. *Parsonidites* fsp., *?Apocynaceae,* slide: 89/2A–3; cross-table number: 18.9/130.9.
3,4. *Striaperipollis gracillistriatus* KRUTZSCH 1966, *Polemoniaceae,* slide: 89/21–2; cross-table number: 6.8/133.9.
5,6. *Striaperipollis gracillistriatus* KRUTZSCH 1966, *Polemoniaceae,* slide: 89/13–3; cross-table number: 23.6/124.6.
7,8. *Restioniidites hungaricus* (KEDVES 1965b) ELSIK 1968, *Restionaceae,* slide: 89/1–1; cross-table number: 8.1/126.2.
9,10. *Restioniidites hungaricus* (KEDVES 1965b) ELSIK 1968, *Restionaceae,* slide: 89/4–1; cross-table number: 9.6/131.7.
11,12. *Restioniidites hungaricus* (KEDVES 1965b) ELSIK 1968, *Restionaceae,* slide: 89/2A–2; cross-table number: 9.5/126.3.
13,14. *Restioniidites hungaricus* (KEDVES 1965b) ELSIK 1968, *Restionaceae,* slide: 89/2A–3; cross-table number: 12.2/129.8.
15,16. *Milfordia incerta* (THOMSON and PFLUG 1953) KRUTZSCH 1961, *Restionaceae,* slide: 89/2A–3; cross-table number: 11.4/129.2.
17,18. *Ericipites longisulcatus* WODEHOUSE 1933, *Ericaceae,* slide: 89/1–1; cross-table number: 11.8/121.6.
19,20. *Ericipites crassiexinus* HARRIS 1972, *Ericaceae,* slide: 89/1–3; cross-table number: 23.2/126.2.

view of the geological age, the occurrences of the following *angiosperm* pollen taxa are important:

Nudopollis endangulatus
Stephanoporopollenites praehexaradiatus
Stephanoporopollenites hexaradiatus hexaradiatus
Stephanoporopollenites hexaradiatus semitribinae
Stephanoporopollenites pentaradiatus
Interpollis supplingensis
Interpollis velum
Plicapollis pseudoexcelsus subfspp.
Subtriporopollenites anulatus nanus
Subtriporopollenites constans constans
Subtriporopollenites constans magnus
Subtriporopollenites subporatus subporatus
Subtriporopollenites subporatus gracillimus
Subtriporopollenites magnoporatus baculatus

Based on the above mentioned early *angiosperm* pollen grains these layers are mostly of Paleocene age. The sporadic occurrence of the *Hystrichosphaeridae* indicate more or less brackish water conditions.

Sample, No 89/8. – Very poor in organic remnants, *Myricaceae, Aquifoliaceae (Ilex)* and probably *Fagaceae* pollen grains were observed.

Sample, No 134/7. – One specimen of early caryoid pollen grain was observed only.

PALEOCENE

Zone G, with *Assilina* sp.

Sample, No 134/12. – Sporadic occurrence of some *Longaxones* and *Brevaxones angiosperm* pollen grains was observed.

Sample, No 89/2A. – The quantity of the *Aquifoliaceae (Ilex), Restionaceae,* and tricolporate pollen types is remarkable. *Hystrichosphaeridae* cysts, *Myricaceae,* and caryoid pollen types are also common. As older *Normapolles* types *Complexiopollis funiculus* and *Pecakipollis bohemiensis* are to be mentioned. By their occurrence, the following taxa are important:

Pentapollenites laevigatus laevigatoides
Interpollis microsupplingensis
Platycaryapollenites platycaryoides

Sample, No 89/1. – *Hystrichosphaeridae* cysts are dominant, with sporadic occurrence of the species of *Deflandrea.* The sample is rich in angiosperm pollen types. Pollen grains of *Myricaceae,* and the caryoid types of *Juglandaceae, Aquifoliaceae (Ilex), triporate types,* and *Plicapollis pseudoexcelsus* subfspp. are also common. The occurrence of the following taxa is important:

Psittacopollis elaeagnoides
Basopollis basalis
Stephanoporopollenites hexaradiatus tribinae
Interpollis messelensis

Interpollis velum
Megatriopollis cf. *santonius*
Jarzenipollenites trinus
Gallopollis fsp.
Caratinipollenites palaeocenicus
Platycaryapollenites swasticoidus
Subtriporopollenites anulatus anulatus
Reevesiapollenites eocaenicus
Retistephanoporites krutzschii
Restioniidites hungaricus
Ericipites fspp.

Sample, No 99/1. – The extreme dominance of the *Hystrichosphaeridae* in this sample is characteristic. The occurrence of the pollen grains is not so common. The *Aquifoliaceae (Ilex)* occurred in the highest quantity. *Restionaceae* and "caryoid types" *(Juglandaceae)* are common. The occurrence of the following form-species is worth mentioning:

Polycolpites transdanubicus
Psilatricolporites globus
Tetracolporopollenites hungaricus
Basopollis urkutensis
Triporopollenites pflugii

EOCENE

Zone H, with *Milioliidae.*

Sample, No 134/1. – Very poor in organic remnants, one *Restionaceae* pollen grain and a damaged *Nudopollis* was observed.

Discussion and Conclusions

The investigated Upper Cretaceous samples are poor in *angiosperm* pollen grains. Taking into consideration the geographical position of the localities investigated, there are several problems to solve within the *Normapolles* province of the Iberian Peninsule.

During our present investigations the occurrence of the typical Maestrichtian *Normapolles* taxa isolated from the sediments of the type locality were not observed (KEDVES and HERNGREEN 1980, HERNGREEN, FELDER, KEDVES, and MEESSEN, 1986). The *angiosperm* pollen assemblage of zone "F" is of a typically Paleocene type, with the relative richness of the "hexaradiatus" pollen type. Worth of mentioning is the earliest type within this group, the *St. praehexaradiatus.* In this way based on the occurrence of the *angiosperm* pollen grains a Monsian or Dano-Monsian age can be presumed. It is also important that the size of these *Normapolles* and early *Postnormapolles* taxa is relatively larger as general. This phenomenon was described by KRUTZSCH and VANHOORNE (1977) from the Paleocene layers of Loksbergen (Belgium). In all probability older (Upper Cretaceous) reworking is in the sample No,

89/2A. Older pollen types are present also in the sample No 89/1; *Psittacopollis elaeagnoides, Megatriopollis* cf. *santonius* and *Jarzenipollis trinus.*

Concerning the presented results it is necessary to stress again and again, that the important role of the *Ilex* genus in the Lower Paleocene vegetation is unusual. The well preserved and very characteristic Paleocene *Normapolles* taxa in sample 89/13 can be a very useful reference assemblage for this interesting and important period.

From the point of view of the second contribution of this number it is regrettable that in the investigated section we have not well preserved pollen material from the Eocene sample.

Acknowledgements

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